(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 430 667 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90312939.3**

(51) Int. Cl.5: **E04F 13/08**

(22) Date of filing: **28.11.90**

(30) Priority: **28.11.89 GB 8926808**

(43) Date of publication of application:
05.06.91 Bulletin 91/23

(84) Designated Contracting States:
BE DE DK ES FR NL Bulletin 2

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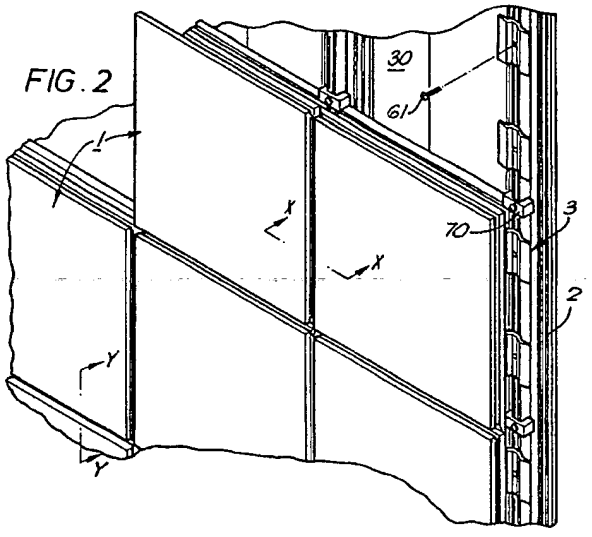
(54) Cladding panel and system.

(57) A cladding system comprises a plurality of panels (1) arranged contiguous to one another and fastened to a plurality of spaced, elongate carrier rails (2) which are arranged to extend substantially parallel to one another and substantially vertically. The panels (1), which are individually removable and fully interchangeable, are fixed to the rails (2) by means of clamping assemblies (3). A seal (17) extends around the perimeter of each panel (1), and in the affixed position, the surrounding perimeter seal of one panel abuts the surrounding perimeter seal (17) of each of the four adjacent panels (1). The abutting seals (17) together form a waterproof surface which is presented to the exterior of the building.

FIG. 2



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A CLADDING PANEL AND SYSTEM

The present invention relates to a cladding panel and system.

It is known to provide a non load-bearing cladding system for the exterior of buildings and other structures, which is formed of a number of identical, and therefore interchangeable panels. However, there are a number of problems with such prior art systems as are available.

For example, it is often required to have both an externally expressed joint and front fixing for the panels. This is currently achieved by forming the panels to overlap and then fixing the panels to a supporting structure through the overlapping portions of each panel. Of course, this makes it impossible to remove one panel if required without removing adjacent panels.

Where the cladding is to be used on the exterior of buildings and the like it needs to be sealed against moisture ingress. In current systems, a prefabricated panel is taken to the site, and as the panels are assembled together, sealing means are interposed between adjacent panels and between the panels and the supporting structure. However, the need to seal the panels as they are erected on site makes it more likely that an inefficient seal will be obtained, for example, because of poor workmanship and the like.

According to a first aspect of the present invention there is provided a panel for use in a cladding system comprising a perimetral frame, and two panel members secured to opposed side faces of said frame such that said panel members are spaced apart by said frame, wherein said panel further comprises a substantially endless primary sealing member supported by said frame and extending around the perimeter of said panel between said two panel members.

The substantially endless primary sealing member of a panel of the invention is fitted to the panel in the factory. This simplifies the on site assembly of the system as it is only necessary to arrange panels adjacent to one another and then fix them to the support. It is not necessary to affix any seals to the panel on site. This also has the further advantages that the seals can clearly be properly affixed to the panels in the factory, and that there is no possibility of moisture being present between the panel and the seal as can happen on site where the panels have been exposed to adverse weather conditions.

In a preferred embodiment said frame has a substantially identical cross-sectional shape over the entire perimeter of the panel, and said frame is symmetrical about an axis which extends generally between the two panel members. In view of this symmetrical construction, the panels are not directed and can be arranged in abutment to adjacent panels in any orientation. Such non-directed panels are much cheaper to produce than systems with overlapping panels where both male and female panel members are required.

For simplicity, it is also preferred that the primary sealing member be supported on said frame to be substantially equidistantly positioned between the two panel members.

In a preferred embodiment, the frame is formed from one or more sections of an extruded profile member. For example, the sections may be arranged to form a frame, and hence a panel, having a circular, triangular or other perimetral shape. Generally, it is preferred that the panels be rectangular, and in some instances the panels will be square.

In an embodiment, the profile member is shaped to define an outwardly opening channel arranged between said opposed side faces of the frame. Preferably, the channel is centrally spaced between the opposed side faces. Said endless primary sealing member is supported on said frame by engagement in said channel.

In one embodiment, the primary sealing member comprises a hollow elongate, generally tubular, seal body integrally formed with fixing means engaged within said channel. The cross-sectional shape of said seal body may be chosen as required, but preferably has a relatively large outwardly directed contact surface. Preferably, the tubular seal body is also integrally formed with an elongate, outwardly projecting lip.

In an embodiment, the profile member forming the frame is provided, inwardly of at least one side face thereof, with means within which an auxiliary sealing member may be supported. In one particular embodiment, at least one side face is extended and curved inwardly to form a substantially U-shaped cross-section elongate lip with which said auxiliary sealing member is engaged.

The panel members, the frame, and the sealing members may be made of any suitable materials.

The invention also extends to a cladding assembly comprising a plurality of panels as defined above arranged contiguously, wherein, the parts of the endless primary sealing members which extend along adjacent edges of adjacent panels are in abutment.

The present invention also extends to a cladding assembly comprising a plurality of panels arranged contiguously, wherein each said panel has a substantially endless primary sealing member extending around its perimeter, and wherein

the part of the sealing member of each panel which extends along part of the panel perimeter which is adjacent to part of the perimeter of an adjacent panel is arranged to abut the sealing member on that adjacent perimeter.

Preferably, the panels are arranged such that abutting parts of the primary sealing members are in compression.

The panels of the cladding assembly may comprise one or more of the features of the panels defined above.

In an embodiment, each endless sealing member comprises a hollow elongate seal body formed with an elongate outwardly projecting lip. The lips of adjacent abutting sealing members are arranged to overlap.

The invention also extends to a cladding system having an assembly of panels as defined above secured to a supporting system by way of securing means.

Preferably, the securing means are arranged to be selectively fastened or released by way of a tool member extending between two sealing members in abutment.

The cladding system preferably includes an assembly of panels and/or individual panels having one or more of the features defined above.

According to a further aspect of the present invention there is provided a cladding system for securing to a supporting structure, said cladding system comprising a plurality of panels each having a sealing member extending around its perimeter, the panels being arranged contiguously such that the sealing member of each panel is in abutment with sealing members of adjacent panels, and securing means for securing said panels to the supporting structure, wherein said securing means are arranged to be selectively fastened or released by way of a tool member extending between two sealing members in abutment.

The cladding system may comprise panels and/or an assembly of panels having one or more of the features defined above.

In a preferred embodiment, said securing means include a rotatable screw or bolt, and the tool member may be a screwdriver or appropriate key arranged to rotate the screw or bolt. In an embodiment, the or each securing means is a clamping assembly arranged to engage a respective panel and the supporting structure. Rotation of said screw or bolt tightens or releases the clamping action.

In a preferred embodiment each panel comprises a perimetral frame on which a substantially endless primary sealing member is supported, and the frame is provided with a spacing or channel in which a clamping arm of said securing means is receivable. Preferably, the clamping arm is provided on a clamping plate which is arranged to be slid in to and out of said spacing, and secured in position by way of said tool member. It would also be possible to provide a rotatable clamping arm if required.

In an embodiment, said securing means further comprises an elongate carrier rail which is arranged to be bolted or otherwise affixed to a supporting structure, the carrier rail being provided with a channel in which part of a clamping assembly is slidably receivable.

In an alternative embodiment, the supporting structure is formed to incorporate an elongate carrier rail provided with a channel. For example, the carrier rail may be integrally formed with said supporting structure. The securing means then comprises a clamping assembly which has a part which is slidably receivable within said channel.

In a preferred embodiment, said carrier rail is also provided with additional channels in which sealing members, for example, endless sealing members, are received.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows schematically part of a supporting structure for a cladding system of the present invention,

Figure 2 shows a perspective view of a partially assembled cladding system of the present invention,

Figure 3 is a generally horizontal section taken along the line X-X of Figure 1 and showing details of the abutment and fixing of adjacent, substantially vertical edge faces of two panels of the cladding system,

Figure 4 is a generally vertical section taken along the line Y-Y of Figure 1 and showing details of the abutment and fixing of adjacent, substantially horizontal edge faces of two panels of the cladding system,

Figure 5 is part of a generally vertical section similar to that of Figure 4 but showing details of the abutment and fixing of substantially horizontal edge faces of two alternative panels of a cladding system of the invention,

Figure 6 is an enlarged view illustrating the cross-sectional shape of a carrier rail of the cladding system of Figure 5,

Figure 7 shows a clamping assembly for securing adjacent pairs of panels of the cladding system,

Figure 8 shows a generally horizontal section of an embodiment of a panel for the cladding system, arranged to carry a pane of glass,

Figure 9 shows a generally vertical section of two adjacent glazed panels, and

Figure 10 shows a generally vertical section of an alternative embodiment of a panel for the clad-

ding system arranged to carry a pane of glass.

In the drawings identical reference numerals have been used to refer to the same or similar features.

Figures 1 and 2 illustrate a cladding system of the invention during its assembly. This cladding system comprises a plurality of panels 1 arranged contiguous to one another and fastened to a plurality of spaced, elongate carrier rails 2 which are arranged to extend substantially parallel to one another and substantially vertically. The cladding system is intended to be non-load bearing and is to be fixed by way of the carrier rails 2 to the exterior of buildings and other structures, for example, to provide insulation for the structure.

As is indicated in Figure 1, when assembling the cladding system, the carrier rails 2 are first fixed to the external surface of a building or structure to extend in spaced, substantially parallel arrangement. For example, each of the rails 2 may be secured directly by threaded bolts (not shown) to a respective one of a plurality of spaced, substantially parallel, vertically extending support beams 30 of the structure. Alternatively, each carrier rail 2 can be integrally formed with each said support beam 30 to form a supporting structure for the panels 1 which thereby define a curtain wall.

In general, and as we shall see, the panels are arranged to be individually removable and fully interchangeable. The panels 1 are fixed to the elongate carrier rails 2 to extend in a generally vertical plane by means of clamping assemblies, generally indicated at 3, such that there is abutment between horizontally and vertically extending adjacent end faces of adjacent panels. The clamping assemblies 3 are also described in more detail below. Slippage or creep of the panels 1, once they have been clamped into position on the carrier rail 2, can be prevented by one or more saddle blocks 70. Each of the saddle blocks 70 is engaged with a respective carrier rail 2 and is used to determine accurately the position of one or more of the panels 1.

The individual panels 1, from which the cladding is formed, each comprise a perimetral frame 4, which in the embodiment illustrated in Figure 2 is generally square. In the embodiment illustrated, the frame 4 is formed from four sections of an extruded profile member 4a, such that, and as will be apparent from Figures 3 and 4, all four sections of the frame 4 have exactly the same cross-sectional shape. The profile member 4a may of course be extruded from any suitable material, such as aluminium and the like. It is currently preferred to extrude the profile member 4a from uryl-polyvinyl chloride (UPVC). Two substantially flat, panel sheets are secured to, and spaced apart by, opposed side faces of the frame member 4 of each panel 1, the sheets extending substantially parallel to one another to define an outer skin 5 and an inner skin 6 for each panel 1. The material of the panel sheets 5, 6 may be chosen as is required, but preferably the sheets are made of aluminium or of a suitable steel, for example P.C. steel. Preferably, the inner and outer sheets 6 and 5 are secured to the frame 4 of each panel by way of a suitable adhesive. Furthermore, and as can be seen in Figures 3 and 4, a core 14 of an insulating material, for example of "Styrofoam", is preferably provided within the frame 4 and between the two spaced sheets 5 and 6. This core 14 may be held in position simply by its location within the frame 4 and the sheets 5 and 6, or it may be bonded to one or more of these structures if required.

Figure 5 is a view similar to that of Figure 4 showing horizontal edge faces of two panels. However, the profile member forming the frame of each panel of Figure 5, whilst being very similar to that illustrated in Figures 3 and 4, has a different detailed shape. In Figure 5, the detailed cross-sectional shape of a section of the profile member 4a which is used to form the frame 4 of each panel can be seen clearly and will now be described. In this respect, it will be recalled that the panels 1 of Figure 2 are square and have identical profile member sections 4a along each of their edge faces. Thus, whereas Figure 5 shows a horizontally extending edge face, the corresponding vertically extending edge face will be the same.

The detailed shape of the profile member may be altered as required, for example, for ease of extrusion, and to provide strength where required. In this respect, Figures 4 and 5 show two different detailed shapes and it will be apparent that other detailed shapes can be proposed.

The profile member 4a illustrated in Figure 5 is an elongate extrusion having a central elongate tubular part 4b which is interposed between two lateral, elongate, hollow sections 10. The central elongate tubular part 4b is bounded by a first pair of opposed, transversely extending, spaced walls 4c. The tubular part 4b is also bounded by a pair of opposed walls 4d which extend substantially parallel to the outer sides of the profile 4a and each define an inner wall of the hollow sections 10. In this respect, the outer sides of the profile member 4a are defined by a pair of walls 4e which define the outer wall of each hollow section 10 and which each extend substantially parallel to, and in contact, with an edge region of either the inner or outer sheet 6, 5 of the panel 1.

It will also be seen that each of the outer walls 4e is extended outwardly of the respective hollow section 10 and ends in a substantially U-shaped cross-section elongate lip 7. In the embodiment illustrated, the edges of each of the front and rear

sheets 5, 6 of the panel 1 are adhered to the whole of the length of the outwardly extended portion of each wall 4e and to part of the outer curved surface of the lip 7. However, and as is indicated in dotted lines, the edges of the sheets 5 and 6 may extend over the whole length of the outer curved surface of the lip 7. The outer surfaces of the edges of the sheets 5 and 6 fastened to the lip 7 form the outer edge faces of the panel 1.

As can be seen in Figure 5, each lateral hollow section 10 is formed to have two elongate cavities 10a and 10b extending therethrough. This defines a transverse web 10c across each hollow section 10 to provide strength. It will be seen that at their inner ends, each hollow section 10 has a transverse wall which is an extension of the innermost transverse wall 4c of the central tubular part 4b.

An elongate channel member 11 having a substantially H-shaped cross-section is positioned between, and spaced from, each of said hollow sections 10. In this respect, the channel member 11 comprises two spaced walls 12 extending longitudinally of the profile member 4a and outwardly from the outermost transverse wall 4c. As can be seen, the two walls 12 extend from the wall 4c, and initially extend towards one another and then are cranked and continue substantially in parallel to one another. At their outer end, each of the walls 12 is bent towards the other wall to form an elongate shoulder 12a. The two walls 12 of the channel member 11 are connected by way of a crossbar 13 which defines the base of an elongate channel 15 having an outwardly directed opening defined between the facing shoulders 12a. As shown, and as described further below, this channel 15 is arranged to support a primary seal 17 for the panel 1.

The channel member 11 is centrally disposed along the transverse extent of the outermost transverse wall 4c of the profile member. In addition, the hollow sections 10 at each side of the profile member 4a are substantially identical in shape and size. It will immediately be appreciated that the profile member 4a is therefore symmetrical about an axis Z-Z which extends at right angles to both its longitudinal and transverse extents. A respective spacing 16 is defined between the channel member 11 and each hollow section 10, and it will be also appreciated that the transverse extent of both of the spacings 16 is identical. As we shall see, part of each clamping assembly 3 is received by an appropriate spacing 16.

When four sections of profile member 4a have been fixed together to form the frame 4, the innermost walls 4c of the sections define an internal perimeter wall of the frame 4 which encloses the core 14. Abutting edges of each profile member section 4a are carefully joined, for example by mitred corners (not shown), so that the hollow sections 10 and the interposed channel member 11 extend continuously around the whole perimeter of the panel 1.

The outwardly open channel 15 of the frame 4 extends completely around the perimeter of the panel 1 and is arranged to receive the primary seal 17. This seal 17 is held by the channel 15 such that it also extends continuously around the entire periphery of the panel 1.

The primary seal 17 comprises a hollow elongate generally tubular seal body 18 whose wall carries fixing means 19. In the embodiment illustrated, the fixing means 19 comprises a further elongate tubular member integrally formed with the wall of the seal body 18 and having an external wall 21 which is remote from the seal body 18. This external wall 21 is extended on either side of the tubular member 19 to define elongate projections 22. In known manner, the fixing member 19 is pressed into the outwardly open channel 15 of the profile member 4a such that the projections 22 engage behind the shoulders 12a and thereby hold the seal 17 in the position shown.

The material of the seal 17 and of its integral fixing means 19 needs to be resilient and it should also be waterproof. For example, the seal 17 may be made of vulcanised rubber or from elastomer. In a preferred embodiment the seal is formed from ethylene-propylene-diene monomer (EPDM). It will be appreciated that the resilience of the material from which the seal is made assists in the positioning of the projections 22 in abutment with the shoulders 12a of the channel 15 whereby the seal 17 is securely held on the profile member 4a.

It would be possible to form the seal 17 in four lengths, with each such length attached to one of the profile member sections 4a of the frame 4. However, it is preferred to form an endless gasket from one or more lengths of the seal 17 to extend around the perimeter of the panel 1. The or each length of the seal 17 may be connected as required, but it is important to ensure that the seal remains hollow as it extends around corners of the panel 1.

The cross-sectional shape of the body 18 of the seal 17 may be chosen as is required. In the embodiment illustrated the seal body 18 has a substantially planar wall part to which the fixing means 19 is attached. This planar wall part abuts the outer surface of the shoulders 12a of the channel member 11 whereby the position of the seal 17 on the frame 4 is reliably established. It will also be seen that in the embodiment of Figure 5, projections 18a are formed on the planar wall part to facilitate the reliable positioning of the 17 on the frame 4. If required, adhesive could be used to adhere the planar wall part of the seal body 18 to

the outer surfaces of the shoulders 12a.

In the embodiment illustrated, the profile of the seal body 18 approximates to a parallelogram shape except that the remaining parts of its wall are curved. It would be possible, for example, for the remainder of the wall of the seal body 18 to include angles, or to be straighter, but the slightly flattened shape illustrated in the drawings is generally preferred as, as can be seen, it defines a large, outwardly directed contact surface on the seal body for abutment with the primary seal on an adjacent panel.

In the embodiment illustrated, the tubular seal body 18 is integrally formed with an elongate, outwardly projecting lip 23.

The panels 1 described above can be formed in a factory, and the primary seal 17 can be factory fitted to extend continuously around the perimeter of each panel. In this respect, the panels 1 are distinct from known interchangeable panels which have to have appropriate sealing means affixed thereto as they are assembled on site.

We have already seen from Figure 2 that the panels 1 are to be affixed to the external surface of a building or other structure such that the panels 1 are substantially adjacent to one another. In the affixed position, and as is clearly shown in Figure 5, the surrounding perimeter seal 17 of one panel is arranged to abut part of the surrounding perimeter seal 17 of each of the four adjacent panels 1. Figure 3 shows the vertically adjacent edges of two adjacent panels showing the abutment of their seals 17, and Figures 4 and 5 show the horizontally extending adjacent edges of two adjacent panels 1 again showing the abutment of their primary seals 17. It will be appreciated that it is the outwardly directed contact surfaces of two adjacent primary seals 17 which are arranged to abut, and also that the projecting lips 23 of the two adjacent seals overlap. In this manner it can be ensured that the abutting seals 17 together form a waterproof surface which is presented to the exterior of the building.

A cross-section through one of the carrier rails 2 for supporting the panels 1 is shown in Figure 6. It will be seen that the detailed shape of the rail 2 of Figure 6 differs in minor details from that shown in Figure 3, but clearly the detailed shape of the rail 2 is a matter of choice. Each rail 2 is preferably extruded, for example from aluminium, and is arranged to have a generally rectangular profile with a back plate 25 spaced by way of side walls 26 from a front plate 27. A plurality of fixing holes may be aligned along the longitudinal extent of the back plate 25 substantially centrally thereof through which threaded bolts may be inserted to fix each carrier rail 2 onto the supporting structure, for example onto the beams 30. Where the carrier rail 2 is integrally formed with the supporting structure, no such fixing holes are provided.

The extrusion forming the rail 2 is divided longitudinally into three sections by way of two internal elongate webs 31 which extend at right angles to both the transverse and longitudinal extents of the rail 2. The two webs 31 extend towards one another for part of their extent, and then are bent to extend substantially parallel to one another and to the side walls 26. The three sections so formed are substantially identical in their transverse extent, and the two outer sections are configured to each form a substantially closed, elongate hollow channel 32 which acts as a strengthening channel. Additionally, each outer section of the rail 2 is formed to have an outwardly opening channel member 33 opening in its front plate 27 and an outwardly opening channel member 34 opening in its back plate 25. In the central section of the extrusion forming the rail 2, a substantially central, outwardly opening channel 35 is defined which opens in the front plate 27. The opening of this channel 35 is defined between two facing, elongate shoulders 36 formed by the front plate 27. In the embodiment illustrated, the longitudinally extending outer edge of the shoulders 36 are affixed to an elongate rail 37.

We have seen that each carrier rail 2 may be fixed on site to the structure to be cladded by threaded bolts or screws which are fitted to extend through holes provided in the back plate 25 of the rail 2. In this respect, each carrier rail 2 may be effectively extended by affixing it to the structure, for example to a beam 30, such that its upper and/or lower end is adjacent a further length of the extruded carrier rail. If required, for example for strength, two adjacent carrier rails can be connected by way of an extension plate (not shown) for example arranged to extend for a short way within the channels 35 of the two adjacent rails. Additionally and/or alternatively, extension plates or other fixing devices can be arranged to extend within the outer channels 32 of the adjacent rails 2.

Once the carrier rails 2 are in position, auxiliary elongate sealing strips 40 (Figures 1, 3 and 6) are fitted in each of the channel members 33 in the front plate 27 of each rail 2. Each of the auxiliary sealing strips 40 may be made of any suitable resilient and waterproof material, for example, of vulcanised rubber or EPDM. Each sealing strip 40 is suitably shaped for engagement in a respective channel member 33. For example, and as is shown in Figures 3 and 6, each sealing strip 40 has a body member 41 with integrally formed fixing means for securing the sealing strip 40 within the channel member 33. In the embodiments illustrated, the fixing means comprise a first pair of outward projections 42 spaced from a second pair

of outward projections 43, the two pairs of projections being arranged to grip around the opening of the channel member 33. The second pair of projections 43 are substantially planar and form an elongate skirt portion which extends transversely outwardly on either side of the body portion 40. It will be seen that the sealing strip 40 is engaged within each channel member 33 such that the skirt portions 43 and the interposed part of the body 40 face outwardly. As will be seen from Figure 3, when a panel 1 is secured relative to the rail 2, each auxiliary sealing strip 40 is arranged to provide a substantially vertically extending seal which engages the inner skin 6 of the panel 1 at a vertically extending edge of that inner skin 6.

When the panels 1 are affixed to the carrier rails 2 it is important that horizontally extending seals should also be provided. Figures 4 and 5 show the abutment of alternative embodiments of adjacent, substantially horizontally extending edges of two panels 1 and illustrates one way of providing horizontally extending seals. In this respect, before each panel 1 is fitted to the rails 2 it is fitted with a horizontally extending auxiliary sealing strip 50. As previously, each sealing strip is made of a suitable resilient and waterproof material, for example of vulcanised rubber or EPDM. The auxiliary sealing strip 50 can be fitted to the individual panels 1 on site, but they are preferably factory fitted.

As is clearly shown in Figures 4 and 5, each horizontally extending, auxiliary sealing strip 50 comprises a substantially rectangular cross-section seal body 51 formed with appropriate fixing means 52. In the embodiment of Figure 5, the seal body is integrally formed with the fixing means 52. In the embodiment of Figure 4, the seal body 51 is formed of a material having increased resilience as compared to the material of the fixing means 52, and the seal body 51 and fixing means 52 are suitably connected. It will be seen that in each case, the sealing strip 50 is secured by engagement with an appropriate part of a horizontally extending section of the frame 4. For example, and as illustrated, the fixing means are defined by a substantially U-shaped cross-section, elongate lip 52 which extends from the seal body 51 and which is arranged to engage the elongate lip 7 formed at the rear of the frame 4.

A clamping assembly for securing two adjacent panels 1 to a rail 2 is illustrated in Figure 7. In this respect, each clamping assembly 3 comprises an extruded aluminium clamping plate 60 having a bore 62 through which a screw 61 is to extend. The screw 61 is preferably also made of stainless steel. At its free, threaded end, the screw 61 extends through a bore, in a fixing block 64. A nut 63 is carried by the block 64 to engage the screw 61.

The clamping plate 60 is formed to comprise two oppositely projecting cranked arms 65 which at their outer ends are each increased in thickness to define a clamping pad.

Figure 3 shows the abutment of adjacent, substantially vertically extending edges of two panels 1 which are fixed to the rail 2 by way of a clamping assembly 3, which is similar to, but not identical to that of Figure 7. It will be seen that in the affixed position, the clamping plate 60 is arranged such that each of its arms 65 is engaged with part of the frame member 4 of one of the panels. In the embodiment illustrated, each arm 65 of the clamping plate 60 engages within the spacing 16 at the inner side of the respective frame 4. The screw 61 extends through the clamping plate 60, between the shoulders 36 of the carrier rail 2 and into the fixing block 64 which is received within the outwardly opening channel 35 of the rail 2. In this embodiment, the fixing block 64 is threaded such that a nut, as 63, is not required. As the screw 61 is screwed into the fixing block 64, the arms 65 of the clamping plate will engage respective walls 4d of the frames 4 of the two panels and thereby draw the two panels towards the rail 2. However, this drawing together of the panels 1 and the rail 2 will be stopped when the fixing block 64 abuts the shoulders 36 of the channel 35. In this condition, both panels 1 are held firmly against the rail 2. Furthermore, it will be seen that in this position, each sealing strip 40 is brought into sealing engagement with the edge region of the inner skin 6 of a respective one of the panels 1.

In the engaged condition shown in Figure 3, the adjacent, vertically extending sections of the primary seals 17 are in abutment to provide a seal along the vertically extending joint of the two panels 1. It will be appreciated from Figure 3, that the abutting primary seals 17 are outwardly of the clamping assembly 3. However, it has surprisingly been found that a conventional tool, such as a screwdriver or an allen key, can be introduced between the two primary seals 17 from the exterior to engage the socket head of the screw 61 to thereby tighten or release the connection by rotation of the screw. It has also surprisingly been found that use of an allen key or other tool in this manner does not adversely affect the seal provided by the two abutting seals 17.

As described above, the panels 1 fixed in the condition shown in Figure 3, carry the horizontally extending sealing strips 50. It will be appreciated that each sealing strip 50 will cross over at least two vertically extending sealing strips 40, and that similarly, each vertical sealing strip 40 will cross over a number of the horizontal sealing strips 50. This ensures that the completed cladding system has drainage continuity without it being necessary to employ sealants. Thus, any water or moisture

which enters in to the cladding system is confined into predetermined drainage channels and is forced to drain harmlessly away to the base of the cladding system. For example, any moisture which penetrates through the primary seals 17 is prevented from moving horizontally by way of the vertically extending auxiliary sealing strips 40. Accordingly, such moisture will drain vertically downwardly in the spaces defined between adjacent frame members 4 or in spaces defined between the panels 1 and the carrier rail 2. Similarly, the horizontally extending sealing strips 50 will tend to channel the moisture from areas centrally of the panels 1 towards the vertically extending edges thereof.

Figure 3 shows the final assembled state of two adjacent panels 1 held in position relative to a rail 2 by way of a clamping assembly 3. The manner in which this final assembly condition of the panels 1 is achieved will now be described.

We have seen that the carrier rails 2 are secured in position and then that the sealing strips 40 are applied. Then a number of clamping assemblies 3 are engaged with each rail 2. In this respect, a required number of the clamping assemblies 3 is engaged with the appropriate rail 2 by insertion of their fixing blocks 64 into the channel 35 at its base. The blocks 64 together with the clamping assemblies can then be slid in turn along the rail 2 to the desired position. Each clamping assembly is loosely attached to the rail 2 by screwing the screw 61 into the block 64.

Once an appropriate number of clamping assemblies 3 have been positioned on a rail 2, vertically extending edges of panels 1 can be secured thereto. In this respect, it will be appreciated that once a panel 1 has been appropriately positioned, each clamping plate 60 can be slid into position along the rail 2 such that one of its arms 65 is brought into engagement in the spacing 16 of the frame 4 of one of the panels to thereby hold and position that panel.

The structure of the clamping assembly 3 and the rail 2 as indicated in Figures 6 and 7 facilitates the construction as the shoulders 36 of the rail 2 are clamped between the rail 37 carried by the rail 2 and the fixing block 64. This ensures reliable clamping of the clamping assembly.

It is preferred that a number of panels should be loosely positioned relative to the rails 2 initially. Then an allen key or screwdriver is inserted between adjacent sealing strips 17 of adjacent panels to finally tighten the clamping assemblies 3 to secure the complete structure.

As described so far, the cladding assembly comprises an array of panels 1 which are connected together and to the rails 2 along the vertically extending edges of the panels. In the system as so far described, there has been no connection between adjacent panels along their adjacent horizontally extending edges. Optionally, connection of horizontally extending panel edges may be required. This can be achieved by way of a clamping plate (not shown) arranged to engage in respective spacings 16 at the rear of a frame member 4 adjacent the sealing strips 50.

In the embodiment illustrated in Figure 2, all of the panels 1 are identical in size and shape. This is generally preferred as it enables the panels to be individually removable and completely interchangeable. It will be appreciated that any panel 1 can be removed from the cladding system by reversing the assembly steps described above.

In the embodiment thus far described, the frame members 4 of all of the panels are symmetrical about their Z-Z axis. This is preferred as it enables a single extruded profile member to be used to form the frame members 4 of all of the panels, and as it also means that the panels are without direction and therefore can be used in any orientation. Not only does this keep manufacturing costs low, it also makes it possible to obtain decorative effects with a small range of panels. For example, if the outer skin 5 of the panels were provided with a linear pattern, for example of ribs, very many different effects could be achieved by orienting the panels such that the ribs extend in different directions.

Clearly, the outer skin 5 of the panels can be of any appropriate material, and can carry any required decoration, colouring or the like.

Figure 8 shows a horizontal section of part of a panel 1 in abutment with an alternative panel 100 which is arranged to carry a double glazing unit 101. The abutted panels 1 and 100 are connected, as described above, to a rail 2 by way of a clamping assembly 3. The glazed panel 100 comprises the sealed double glazing unit 101 which is adhered by sealing strips, as indicated at 102, to an aluminium frame 103. The inner and outer webs forming the frame 103 are different in shape because the inner web 104 is arranged to be connected to a further frame section 114. Close inspection of the frame section 114 will reveal that it has a cross-sectional shape which is similar to about half of that of a frame member 4 of a panel 1. Thus, at the inner side of the panel 100, the frame 114 has a hollow section 10', with a substantially U-shaped lip 7', and a spacing 16' spaces the hollow section 10' from a section 11' which supports a channel 15' in which the sealing strip 17 is received. A wall 116 joins the hollow section 10' and the section 11' and carries projections 118 which engage with shoulders of the inner web 104. Preferably, there is also a screw fixing between the wall 116 and the web 104.

The actual shape of the frame member 103 and the frame section 114 can be chosen much as is required so long as the frame section 114 is presented on the edge of the glazed panel 100 such that the sealing strip 17 is in contact with the sealing strip 17 of an adjacent panel,and the auxiliary sealing strip 40 is able to sealingly contact the external surface of the lip 7'. However, it is noted that in the construction illustrated, sealing means 120, in the form of two substantially parallel, linear seals are arranged within the frame 103 to prevent the ingress of water or moisture from the joint towards the double glazing unit 101.

Figure 8 illustrates how a standard panel 1 can be connected with a special panel 100 arranged to carry a double glazing unit 101. An alternative embodiment is shown in Figure 10, which shows a vertical joint.

Figure 9 also shows a vertical joint, this time between two special panels 100, each panel 100 being constructed as described above with reference to Figure 8. As is indicated in dotted lines, the horizontally extending adjacent edges of the two glazed panels may be braced, for example against wind forces by way of an extruded aluminium wind stiffener 140 having an inner end 142 which would be braced against the support structure, and at its other end a plate 144 which would abut against the outer surface of the inner side hollow sections 10'. The brace 140 also carries an inner plate 145 which is arranged to abut the inwardly curved ends of the lips 7' to hold the adjacent panels 100 together. In this case, the horizontally extending seals 50 would generally be omitted to facilitate engagement of the inner plate 145, but a sealing block (not illustrated) may be interposed between the lips 7'.

It will be appreciated that materials other than double glazing units could also be formed into panels either within a frame 4 as described for the panel 1, or with a specially adapted frame along the lines described for the panel 100. For example, louvres could be supported within a frame. This enables a fully integrated cladding system with maximum flexibility to be formed.

Clearly, the panels, be they panels 1 or 100, can be chosen to have a variety of thicknesses. Of course, one would generally use panels of the same thickness in a particular cladding system, but this is not essential if such is not required. It is of course important to ensure for any particular cladding system that the primary seal 17 of each panel can abut and seal with the corresponding primary seals of adjacent panels. For this reason, and also because of the simplicity afforded to the manufacturing process, it is preferred as far as possible that symmetrical frame members, as the frame 4 of the panels 1 are employed.

It will be appreciated from the above that only the edges of the panels are connected, and in some instances it is only the vertically extending edges which are connected either to adjacent panels or to the carrier rails. Furthermore, the connections are at a number of spaced points. This means that the clamping assemblies and other attachment means described above are not restricted to use with planar panels. Panels which are bent may equally be incorporated in the cladding system if required.

In the cladding system described the primary seals between adjacent panels express the joint and give the overall system a fine jointed external expression. More importantly, fixing of the individual panels to the carrier rails is through the primary seals from the face of the cladding system. This clearly aids in the fixing of the cladding system and also facilitates over cladding.

It will be appreciated that variations and/or alterations to the embodiments described above may be made within the scope of this application.

Claims

1. A panel (1) for use in a cladding system comprising a perimetral frame (4), and two panel members (5, 6) secured to opposed side faces of said frame such that said panel members are spaced apart by said frame, characterised in that said panel further comprises a substantially endless primary sealing member (17) supported by said frame (4) and extending around the perimeter of said panel between said two panel members.

2. A panel as claimed in Claim 1, wherein said frame (4) has a substantially identical cross-sectional shape over the entire perimeter of the panel (1), and said frame is symmetrical about an axis which extends generally between the two panel members (5, 6).

3. A panel as claimed in Claim 1 or 2, wherein said primary sealing member (17) is supported on said frame (4) to be substantially equidistantly positioned between the two panel members.

4. A panel as claimed in any preceding claim, wherein said frame is formed from one or more sections of an extruded profile member (4a), and wherein said profile member is shaped to define an outwardly opening channel (15) arranged between said opposed side faces of the frame.

5. A panel as claimed in Claim 4, wherein said channel (15) is centrally spaced between the opposed side faces, and said endless primary sealing member (17) is supported on said frame (4) by engagement in said channel (15).

6. A panel as claimed in Claim 4 or 5, wherein said primary sealing member (17) comprises a hollow elongate, generally tubular, seal body (18) integrally formed with fixing means (19) engaged within said channel (15), and the tubular seal body is integrally formed with an elongate, outwardly projecting lip (23).

7. A panel as claimed in any of Claims 4 to 6, wherein the profile member (4a) forming the frame is provided, inwardly of at least one side face thereof, with means (7) within which an auxiliary sealing member (50) may be supported.

8. A cladding assembly comprising a plurality of panels (1) arranged contiguously, wherein each said panel (1) has a substantially endless primary sealing member (17) extending around its perimeter, and wherein the part of the sealing member of each panel which extends along part of the panel perimeter which is adjacent to part of the perimeter of an adjacent panel is arranged to abut the sealing member on that adjacent perimeter.

9. A cladding assembly as claimed in Claim 8, wherein the panels (1) are arranged such that abutting parts of the primary sealing members (17) are in compression.

10. A cladding assembly as claimed in Claim 8 or 9, wherein the panels are as claimed in any of Claims 1 to 7.

11. A cladding assembly as claimed in any of Claims 8 to 10, wherein each endless sealing member (17) comprises a hollow elongate seal body (18) formed with an elongate outwardly projecting lip (23), and wherein the lips of adjacent abutting sealing members are arranged to overlap.

12. A cladding system for securing to a supporting structure (2, 30), said cladding system comprising a plurality of panels (1) each having a sealing member (17) extending around its perimeter, the panels being arranged contiguously such that the sealing member (17) of each panel is in abutment with sealing members of adjacent panels, and securing means (3) for securing said panels to the supporting structure, wherein said securing means (3) are arranged to be selectively fastened or released by way of a tool member extending between two sealing members in abutment.

13. A cladding system as claimed in Claim 12, comprising panels as claimed in any of Claims 1 to 7.

14. A cladding system as claimed in Claim 12 or 13, comprising an assembly of panels as claimed in any of claims 8 to 11.

15. A cladding system as claimed in any of Claims 12 to 14, wherein said securing means include a rotatable screw or bolt (61), and the tool member may be a screwdriver or appropriate key arranged to rotate the screw or bolt.

16. A cladding sytem as claimed in Claim 15, wherein the or each securing means is a clamping assembly (3) arranged to engage a respective panel (1) and the supporting structure (2), rotation of said screw or bolt being arranged to tighten or release the clamping action.

17. A cladding system as claimed in any of Claims 12 to 16, wherein each panel (1) comprises a perimetral frame (4) on which a substantially endless primary sealing member (17) is supported, and wherein said frame (4) is provided with a spacing or channel (16) in which a clamping arm of said securing means (3) is receivable.

18. A cladding system as claimed in any of Claims 12 to 17, wherein said securing means further comprises an elongate carrier rail (2) which is arranged to be bolted or otherwise affixed to a supporting structure (30), the carrier rail (2) being provided with a channel (35) in which part of a clamping assembly is slidably receivable.

19. A cladding system as claimed in any of Claims 12 to 17, for securing to a supporting structure (2, 30) incorporating an elongate carrier rail (2) provided with a channel (35), wherein said securing means comprises a clamping assembly (3) having a part slidably receivable within said channel.

20. A cladding system as claimed in Claim 18 or 19, wherein said carrier rail (2) is provided with additional channels (33) in which sealing members (40) are received.

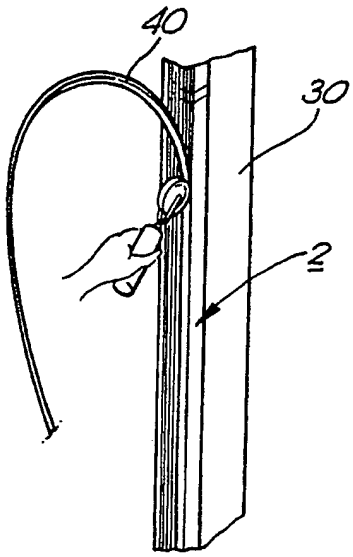


FIG. 1

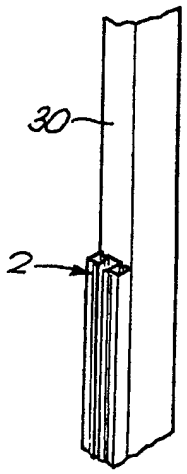
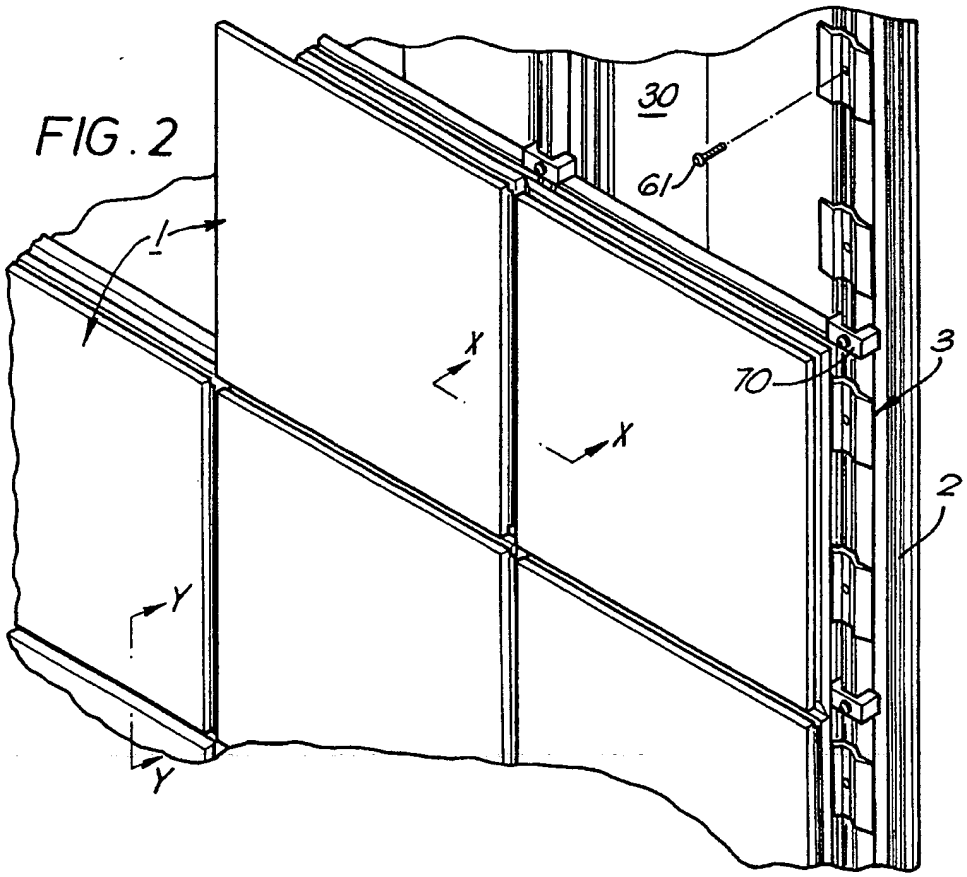


FIG. 2



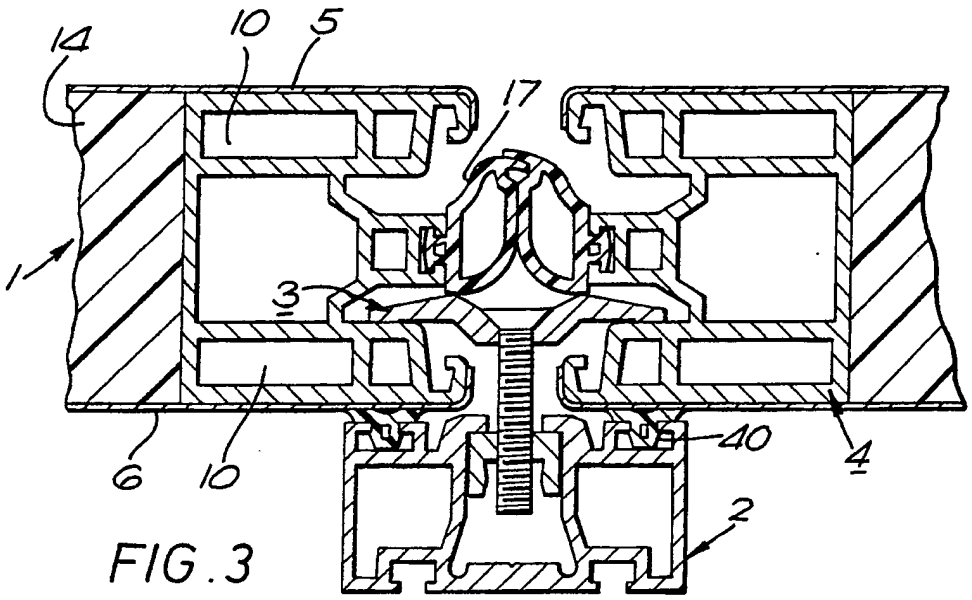


FIG.3

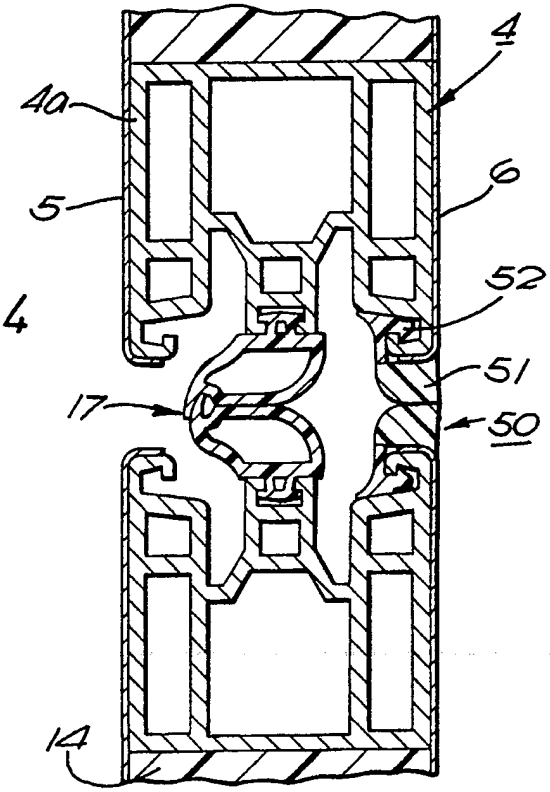
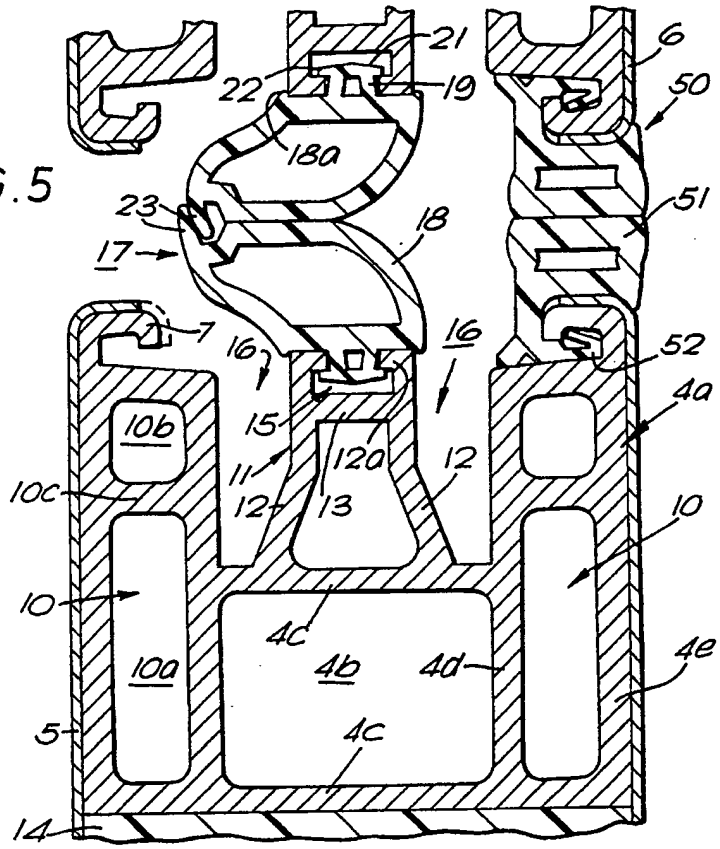


FIG.4

FIG.5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17
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16
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4a
106
15
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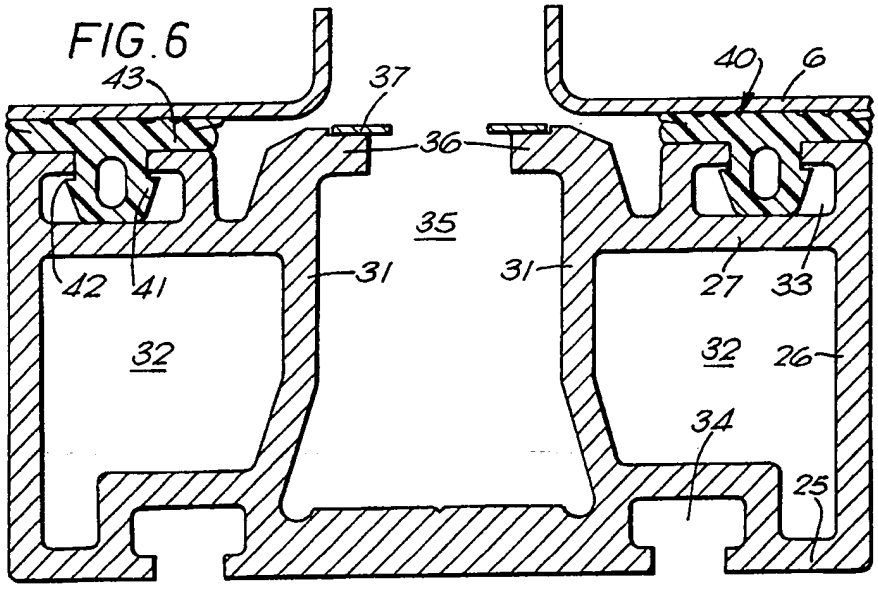
4b
4d
4e
100
5
4c
14

FIG.6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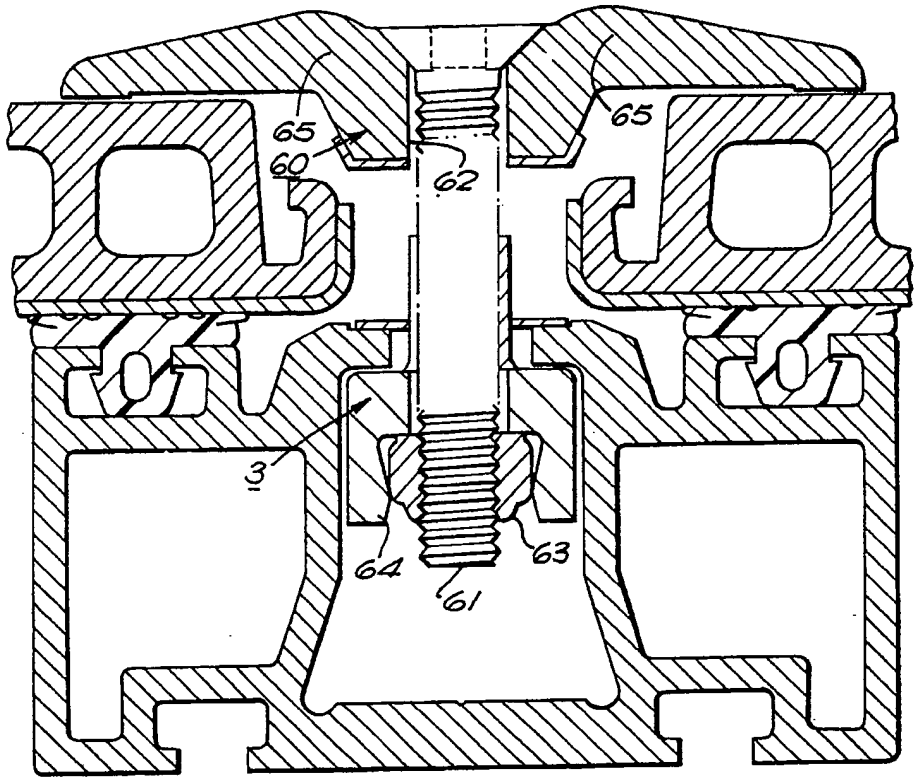
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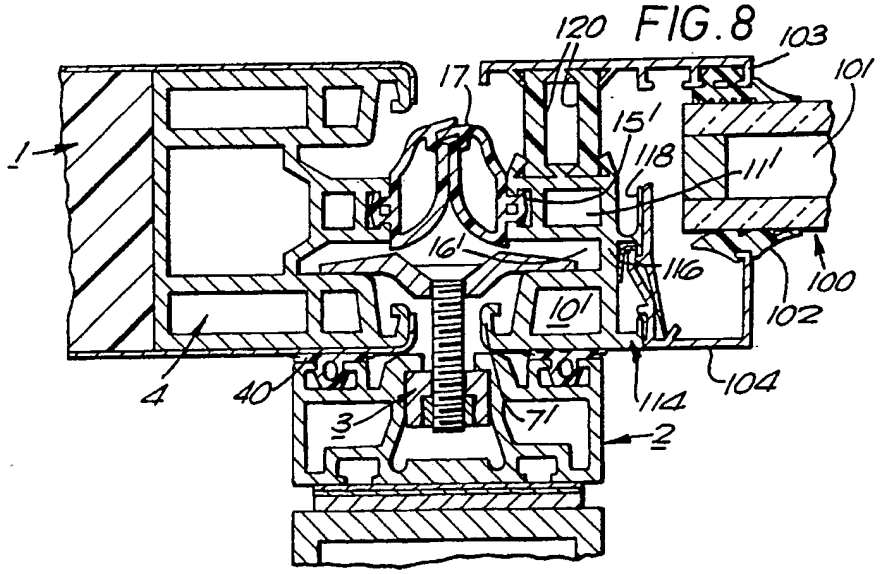
FIG. 7

FIG. 8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2

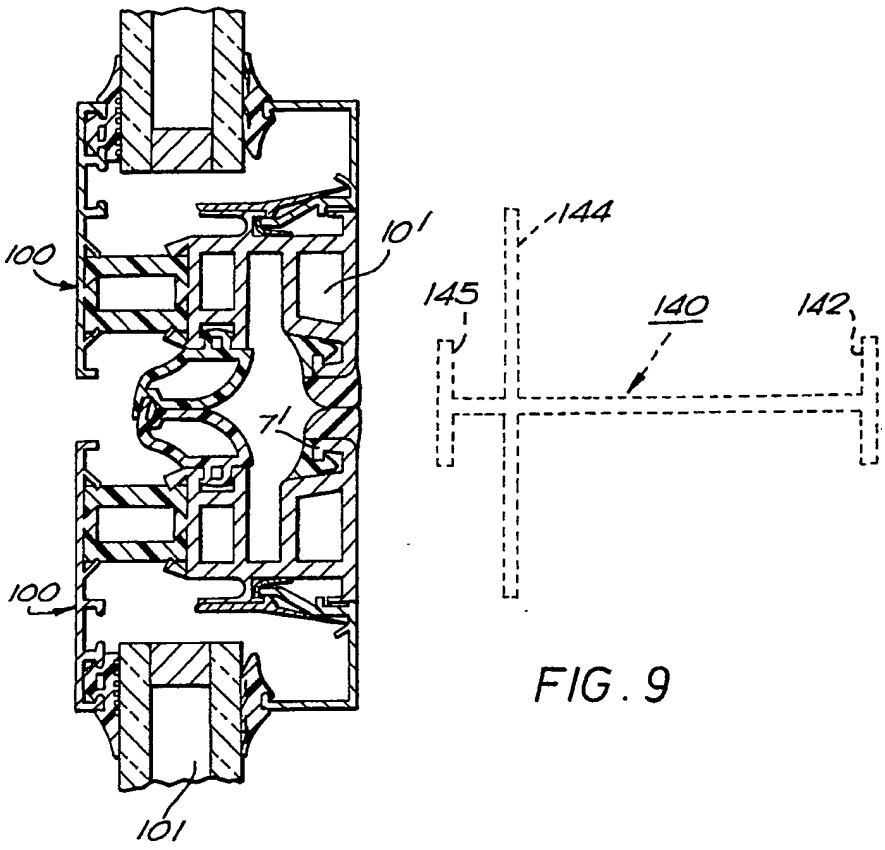
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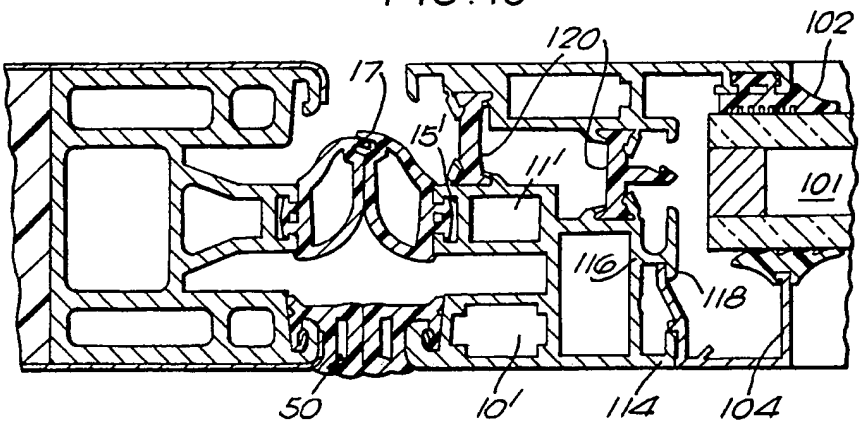
FIG. 9

FIG. 10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